Andreas Krause
Market crashes

Sudden unexplained loss in asset values

- We observe occasionally stock markets loose value significantly
- The loss in value cannot be attributed to new information emerging
- There is also no sudden change in the investment behaviour of investors
- Such a situation is known as a market crash
- It is mostly observed in stock markets

Sudden unexplained loss in asset values

- We observe occasionally stock markets loose value significantly within a very short period of time
- The loss in value cannot be attributed to new information emerging
- There is also no sudden change in the investment behaviour of investors
- Such a situation is known as a market crash
- It is mostly observed in stock markets,

Sudden unexplained loss in asset values

- We observe occasionally stock markets loose value significantly within a very short period of time

Sudden unexplained loss in asset values

- We observe occasionally stock markets loose value significantly within a very short period of time
- The loss in value cannot be attributed to new information emerging
- There is also no sudden change in the investment behaviour of investors
- Such a situation is known as a market crash
- It is mostly observed in stock markets, but it also occurs in real estate, exchange rates, and commodities

Sudden unexplained loss in asset values

- We observe occasionally stock markets loose value significantly within a very short period of time
- The loss in value cannot be attributed to new information emerging
- There is also no sudden change in the investment behaviour of investors
- Such a situation is known as a market crash
- It is mostly observed in stock markets, but it also occurs in real estate, exchange rates, and commodities

Sudden unexplained loss in asset values

- We observe occasionally stock markets loose value significantly within a very short period of time
- The loss in value cannot be attributed to new information emerging
- There is also no sudden change in the investment behaviour of investors
- Such a situation is known as a market crash
- It is mostly observed in stock markets, but it also occurs in real estate, exchange rates, and commodities

Sudden unexplained loss in asset values

- We observe occasionally stock markets loose value significantly within a very short period of time
- The loss in value cannot be attributed to new information emerging
- There is also no sudden change in the investment behaviour of investors
- Such a situation is known as a market crash
- It is mostly observed in stock markets, but it also occurs in real estate, exchange rates, and commodities

Sudden unexplained loss in asset values

- We observe occasionally stock markets loose value significantly within a very short period of time
- The loss in value cannot be attributed to new information emerging
- There is also no sudden change in the investment behaviour of investors
- Such a situation is known as a market crash
- It is mostly observed in stock markets, but it also occurs in real estate, exchange rates, and commodities

Sudden unexplained loss in asset values

- We observe occasionally stock markets loose value significantly within a very short period of time
- The loss in value cannot be attributed to new information emerging
- There is also no sudden change in the investment behaviour of investors
- Such a situation is known as a market crash
- It is mostly observed in stock markets, but it also occurs in real estate, exchange rates, and commodities

Sudden unexplained loss in asset values

- We observe occasionally stock markets loose value significantly within a very short period of time
- The loss in value cannot be attributed to new information emerging
- There is also no sudden change in the investment behaviour of investors
- Such a situation is known as a market crash
- It is mostly observed in stock markets, but it also occurs in real estate, exchange rates, and commodities

Sudden unexplained loss in asset values

- We observe occasionally stock markets loose value significantly within a very short period of time
- The loss in value cannot be attributed to new information emerging
- There is also no sudden change in the investment behaviour of investors
- Such a situation is known as a market crash
- It is mostly observed in stock markets, but it also occurs in real estate, exchange rates, and commodities

Overvaluations and crashes

- Market crashes are often difficult to explain and while it is often obvious ex-post that the assets were overvalued, this was not always seen at the time.
- At other times, markets are significantly overvalued and everyone is aware of this, but no crash occurs.
- We will look at models that explain such overvaluations and how these are corrected.
- We will also will seek to explain the emergence of a crash without much new information arriving in the market.

Overvaluations and crashes

- Market crashes are often difficult to explain and while it is often obvious ex-post that the assets were overvalued, this was not always seen at the time
- At other times, markets are significantly overvalued and everyone is aware of this, but no crash occurs
- We will look at models that explain such overvaluations and how these are corrected
- We will also will seek to explain the emergence of a crash without much new information arriving in the market

Overvaluations and crashes

- Market crashes are often difficult to explain and while it is often obvious ex-post that the assets were overvalued, this was not always seen at the time

Overvaluations and crashes

- Market crashes are often difficult to explain and while it is often obvious ex-post that the assets were overvalued, this was not always seen at the time
- At other times, markets are significantly overvalued and everyone is aware of this, but no crash occurs
- We will look at models that explain such overvaluations and how these are corrected
- We will also will seek to explain the emergence of a crash without much new information arriving in the market

Overvaluations and crashes

- Market crashes are often difficult to explain and while it is often obvious ex-post that the assets were overvalued, this was not always seen at the time
- At other times, markets are significantly overvalued and everyone is aware of this, but no crash occurs
- We will look at models that explain such overvaluations and how these are corrected
- We will also will seek to explain the emergence of a crash without much new information arriving in the market

Overvaluations and crashes

- Market crashes are often difficult to explain and while it is often obvious ex-post that the assets were overvalued, this was not always seen at the time
- At other times, markets are significantly overvalued and everyone is aware of this, but no crash occurs
- We will look at models that explain such overvaluations and how these are corrected
- We will also will seek to explain the emergence of a crash without much new information arriving in the market

Overvaluations and crashes

- Market crashes are often difficult to explain and while it is often obvious ex-post that the assets were overvalued, this was not always seen at the time
- At other times, markets are significantly overvalued and everyone is aware of this, but no crash occurs
- We will look at models that explain such overvaluations and how these are corrected
- We will also will seek to explain the emergence of a crash without much new information arriving in the market

Overvaluations and crashes

- Market crashes are often difficult to explain and while it is often obvious ex-post that the assets were overvalued, this was not always seen at the time
- At other times, markets are significantly overvalued and everyone is aware of this, but no crash occurs
- We will look at models that explain such overvaluations and how these are corrected
- We will also will seek to explain the emergence of a crash without much new information arriving in the market

Rationality and overvaluation

- Many assets are frequently overvalued, while under-valuations are rarely found
- We will see why it is rational to invest into an overvalued asset
- Overvalued assets will eventually lead to a crash, but this explanation is left to the second model

Rationality and overvaluation

- Many assets are frequently overvalued, while under-valuations are rarely found
- We will see why it is rational to invest into an overvalued asset
- Overvalued assets will eventually lead to a crash

Rationality and overvaluation

- Many assets are frequently overvalued, while under-valuations are rarely found

Rationality and overvaluation

- Many assets are frequently overvalued, while under-valuations are rarely found
- We will see why it is rational to invest into an overvalued asset
- Overvalued assets will eventually lead to a crash, but this explanation is left to the second model

Rationality and overvaluation

- Many assets are frequently overvalued, while under-valuations are rarely found
- We will see why it is rational to invest into an overvalued asset
- Overvalued assets will eventually lead to a crash, but this explanation is left to the second model

Rationality and overvaluation

- Many assets are frequently overvalued, while under-valuations are rarely found
- We will see why it is rational to invest into an overvalued asset
- Overvalued assets will eventually lead to a crash, but this explanation is left to the second model

Rationality and overvaluation

- Many assets are frequently overvalued, while under-valuations are rarely found
- We will see why it is rational to invest into an overvalued asset
- Overvalued assets will eventually lead to a crash, but this explanation is left to the second model

Andreas Krause
Rational bubbles
LIVERMORE
TRADING GROUP
NEW YORK STOCK EXCHANGE
ice
STIFEL

Bursting bubbles

- Investors purchase overvalued assets in the anticipation of selling it at an even higher price, making it a rational decision
- Overvalued assets will sooner or later crash and return to their fundamental value, but this risk is compensated

? You observe that based on your analysis, rental properties are significantly undervalued and the undervaluation seems to increase, as negative bubbles cannot occur, how can this be explained?

! Your assessment must be agreed with by the market overall for a deviation from the fundamental to be classified as a bubble; in this instance your assessment might not be shared by the wider market, whether you are correct or not

Bursting bubbles

- Investors purchase overvalued assets in the anticipation of selling it at an even higher price, making it a rational decision
- Overvalued assets will sooner or later crash and return to their fundamental value, but this risk is compensated

? You observe that based on your analysis, rental properties are significantly undervalued and the undervaluation seems to increase, as negative bubbles cannot occur, how can this be explained?

! Your assessment must be agreed with by the market overall for a deviation from the fundamental to be classified as a bubble; in this instance your assessment might not be shared by the wider market, whether you are correct or not

Bursting bubbles

- Investors purchase overvalued assets in the anticipation of selling it at an even higher price, making it a rational decision
- Overvalued assets will sooner or later crash and return to their fundamental value, but this risk is compensated

? You observe that based on your analysis, rental properties are significantly undervalued and the undervaluation seems to increase, as negative bubbles cannot occur, how can this be explained?

! Your assessment must be agreed with by the market overall for a deviation from the fundamental to be classified as a bubble; in this instance your assessment might not be shared by the wider market, whether you are correct or not

Bursting bubbles

- Investors purchase overvalued assets in the anticipation of selling it at an even higher price, making it a rational decision
- Overvalued assets will sooner or later crash and return to their fundamental value, but this risk is compensated

? You observe that based on your analysis, rental properties are significantly undervalued and the undervaluation seems to increase; as negative bubbles cannot occur, how can this be explained?

! Your assessment must be agreed with by the market overall for a deviation from the fundamental to be classified as a bubble; in this instance your assessment might not be shared by the wider market, whether you are correct or not

Bursting bubbles

- Investors purchase overvalued assets in the anticipation of selling it at an even higher price, making it a rational decision
- Overvalued assets will sooner or later crash and return to their fundamental value, but this risk is compensated

? You observe that based on your analysis, rental properties are significantly undervalued and the undervaluation seems to increase, as negative bubbles cannot occur, how can this be explained?

! Your assessment must be agreed with by the market overall for a deviation from the fundamental to be classified as a bubble; in this instance your assessment might not be shared by the wider market, whether you are correct or not

Bursting bubbles

- Investors purchase overvalued assets in the anticipation of selling it at an even higher price, making it a rational decision
- Overvalued assets will sooner or later crash and return to their fundamental value, but this risk is compensated

? You observe that based on your analysis, rental properties are significantly undervalued and the undervaluation seems to increase, as negative bubbles cannot occur, how can this be explained?

! Your assessment must be agreed with by the market overall for a deviation from the fundamental to be classified as a bubble; in this instance your assessment might not be shared by the wider market, whether you are correct or not

Bursting bubbles

- Investors purchase overvalued assets in the anticipation of selling it at an even higher price, making it a rational decision
- Overvalued assets will sooner or later crash and return to their fundamental value, but this risk is compensated

? You observe that based on your analysis, rental properties are significantly undervalued and the undervaluation seems to increase, as negative bubbles cannot occur, how can this be explained?

! Your assessment must be agreed with by the market overall for a deviation from the fundamental to be classified as a bubble; in this instance your assessment might not be shared by the wider market, whether you are correct or not

Bursting bubbles

- Investors purchase overvalued assets in the anticipation of selling it at an even higher price, making it a rational decision
- Overvalued assets will sooner or later crash and return to their fundamental value, but this risk is compensated

? You observe that based on your analysis, rental properties are significantly undervalued and the undervaluation seems to increase, as negative bubbles cannot occur, how can this be explained?

! Your assessment must be agreed with by the market overall for a deviation from the fundamental to be classified as a bubble; in this instance your assessment might not be shared by the wider market, whether you are correct or not

Bursting bubbles

- Investors purchase overvalued assets in the anticipation of selling it at an even higher price, making it a rational decision
- Overvalued assets will sooner or later crash and return to their fundamental value, but this risk is compensated

? You observe that based on your analysis, rental properties are significantly undervalued and the undervaluation seems to increase, as negative bubbles cannot occur, how can this be explained?

! Your assessment must be agreed with by the market overall for a deviation from the fundamental to be classified as a bubble; in this instance your assessment might not be shared by the wider market, whether you are correct or not

Modelling demand for assets

- Stochastic bursting of bubbles is unsatisfactory as an explanation of such significant events
- As prices are driven by demand and supply in the market, we should investigate these factors for an explanation
- Dividing investors into informed investors and uninformed investors allows us to introduce hedging by investors
- We will see how hedging by uninformed investors can lead to market crashes

Modelling demand for assets

- Stochastic bursting of bubbles is unsatisfactory as an explanation of such significant events
- As prices are driven by demand and supply in the market, we should investigate these factors for an explanation
- Dividing investors into informed investors and uninformed investors allows us to introduce hedging by investors
- We will see how hedging by uninformed investors can lead to market crashes

Modelling demand for assets

- Stochastic bursting of bubbles is unsatisfactory as an explanation of such significant events
- As prices are driven by demand and supply in the market, we should investigate these factors for an explanation
- Dividing investors into informed investors and uninformed investors allows us to introduce hedging by investors
- We will see how hedging by uninformed investors can lead to market crashes

Modelling demand for assets

- Stochastic bursting of bubbles is unsatisfactory as an explanation of such significant events
- As prices are driven by demand and supply in the market, we should investigate these factors for an explanation
- Dividing investors into informed investors and uninformed investors allows us to introduce hedging by investors
- We will see how hedging by uninformed investors can lead to market crashes

Modelling demand for assets

- Stochastic bursting of bubbles is unsatisfactory as an explanation of such significant events
- As prices are driven by demand and supply in the market, we should investigate these factors for an explanation
- Dividing investors into informed investors and uninformed investors allows us to introduce hedging by investors
- We will see how hedging by uninformed investors can lead to market crashes

Modelling demand for assets

- Stochastic bursting of bubbles is unsatisfactory as an explanation of such significant events
- As prices are driven by demand and supply in the market, we should investigate these factors for an explanation
- Dividing investors into informed investors and uninformed investors allows us to introduce hedging by investors
- We will see how hedging by uninformed investors can lead to market crashes

Andreas Krause
Hedging and market crashes
LIVERMORE
TRADING GROUP
NEW YORK STOCK EXCHANGE

Hedging can cause crashes

- If hedging is widespread after a prolonged market rise, the demand for assets is non-monotonous
- Small negative information can cause a large drop in asset prices

? Markets rise and fall over time, but not every time a crash occurs, why would markets most of times move slowly?

! We need a large amount of hedging and this hedging has to be at roughly the same strike price, only then do we observe a crash, if either conditions is not fulfilled, markets move smoothly, which is the case most of times

Hedging can cause crashes

- If hedging is widespread after a prolonged market rise, the demand for assets is non-monotonous
- Small negative information can cause a large drop in asset prices

? Markets rise and fall over time, but not every time a crash occurs, why would markets most of times move slowly?

! We need a large amount of hedging and this hedging has to be at roughly the same strike price, only then do we observe a crash; if either conditions is not fulfilled, markets move smoothly, which is the case most of times

Hedging can cause crashes

- If hedging is widespread after a prolonged market rise, the demand for assets is non-monotonous
- Small negative information can cause a large drop in asset prices

? Markets rise and fall over time, but not every time a crash occurs, why would markets most of times move slowly?

! We need a large amount of hedging and this hedging has to be at roughly the same strike price, only then do we observe a crash, if either conditions is not fulfilled, markets move smoothly, which is the case most of times

Hedging can cause crashes

- If hedging is widespread after a prolonged market rise, the demand for assets is non-monotonous
- Small negative information can cause a large drop in asset prices

? Markets rise and fall over time, but not every time a crash occurs, why would markets most of times move slowly?

! We need a large amount of hedging and this hedging has to be at roughly the same strike price, only then do we observe a crash, if either conditions is not fulfilled, markets move smoothly, which is the case most of times

Hedging can cause crashes

- If hedging is widespread after a prolonged market rise, the demand for assets is non-monotonous
- Small negative information can cause a large drop in asset prices

? Markets rise and fall over time, but not every time a crash occurs, why would markets most of times move slowly?

! We need a large amount of hedging and this hedging has to be at roughly the same strike price, only then do we observe a crash, if either conditions is not fulfilled, markets move smoothly, which is the case most of times

Hedging can cause crashes

- If hedging is widespread after a prolonged market rise, the demand for assets is non-monotonous
- Small negative information can cause a large drop in asset prices

? Markets rise and fall over time, but not every time a crash occurs, why would markets most of times move slowly?

! We need a large amount of hedging and this hedging has to be at roughly the same strike price, only then do we observe a crash, if either conditions is not fulfilled, markets move smoothly, which is the case most of times

Hedging can cause crashes

- If hedging is widespread after a prolonged market rise, the demand for assets is non-monotonous
- Small negative information can cause a large drop in asset prices

? Markets rise and fall over time, but not every time a crash occurs, why would markets most of times move slowly?

! We need a large amount of hedging and this hedging has to be at roughly the same strike price, only then do we observe a crash, if either conditions is not fulfilled, markets move smoothly, which is the case most of times

Summary of key results

- Asset prices will increase rapidly during a bubble to compensate investors for the risk of the bubble bursting
- Such bubbles might be bursting based on minor events if the demand is non-monotonous in the price
- Hedging can cause such non-monotonous demand, provided it is a significant fraction of the market
- Market crashes can be caused by minor informational events that would not affect the fundamental value of the asset significantly

Summary of key results

- Asset prices will increase rapidly during a bubble to compensate investors for the risk of the bubble bursting
- Such bubbles might be bursting based on minor events
- Hedging can cause such non-monotonous demand
- Market crashes can be caused by minor informational events

Summary of key results

- Asset prices will increase rapidly during a bubble to compensate investors for the risk of the bubble bursting

Summary of key results

- Asset prices will increase rapidly during a bubble to compensate investors for the risk of the bubble bursting
- Such bubbles might be bursting based on minor events if the demand is non-monotonous in the price
- Hedging can cause such non-monotonous demand, provided it is a significant fraction of the market
- Market crashes can be caused by minor informational events that would not affect the fundamental value of the asset significantly

Summary of key results

- Asset prices will increase rapidly during a bubble to compensate investors for the risk of the bubble bursting
- Such bubbles might be bursting based on minor events if the demand is non-monotonous in the price

Summary of key results

- Asset prices will increase rapidly during a bubble to compensate investors for the risk of the bubble bursting
- Such bubbles might be bursting based on minor events if the demand is non-monotonous in the price
- Hedging can cause such non-monotonous demand, provided it is a significant fraction of the market
- Market crashes can be caused by minor informational events that would not affect the fundamental value of the asset significantly

Summary of key results

- Asset prices will increase rapidly during a bubble to compensate investors for the risk of the bubble bursting
- Such bubbles might be bursting based on minor events if the demand is non-monotonous in the price
- Hedging can cause such non-monotonous demand, provided it is a significant fraction of the market
- Market crashes can be caused by minor informational events that would not affect the fundamental value of the asset significantly

Summary of key results

- Asset prices will increase rapidly during a bubble to compensate investors for the risk of the bubble bursting
- Such bubbles might be bursting based on minor events if the demand is non-monotonous in the price
- Hedging can cause such non-monotonous demand, provided it is a significant fraction of the market
- Market crashes can be caused by minor informational events that would not affect the fundamental value of the asset significantly

Summary of key results

- Asset prices will increase rapidly during a bubble to compensate investors for the risk of the bubble bursting
- Such bubbles might be bursting based on minor events if the demand is non-monotonous in the price
- Hedging can cause such non-monotonous demand, provided it is a significant fraction of the market
- Market crashes can be caused by minor informational events that would not affect the fundamental value of the asset significantly

Summary of key results

- Asset prices will increase rapidly during a bubble to compensate investors for the risk of the bubble bursting
- Such bubbles might be bursting based on minor events if the demand is non-monotonous in the price
- Hedging can cause such non-monotonous demand, provided it is a significant fraction of the market
- Market crashes can be caused by minor informational events that would not affect the fundamental value of the asset significantly

Copyright © by Andreas Krause

Picture credits:
Cover: Tobias Deml, CC BY-SA 4.0 https://creativecommons.org/licenses/by-sa/4.0, via Wikimedia Commons, https://upload.wikimedia.org/wikipedia/commons/2/26/Gaming-Wall-Street_BTS_Prodigium-266.jpg
Back: Michael Vadon, CC BY 2.0 ¡https://creativecommons.org/licenses/by/2.0¿, via Wikimedia Commons, https://upload.wikimedia.org/wikipedia/commons/9/97/Manhattan(NYC-New_York_City)Skyline(31769153946).jpg

Andreas Krause
Department of Economics
University of Bath
Claverton Down
Bath BA2 7AY
United Kingdom

E-mail: mnsak@bath.ac.uk